



J&J-1825.ST25.txt
SEQUENCE LISTING

<110> Kutchan, Toni M.
Zenk, Meinhart H.
Atkins, David G.
Fist, Anthony J.

<120> CODEINONE REDUCTASE FROM ALKALOID POPPY

<130> J&J-1825

<140> US 09/937,665
<141> 2002-02-20

<150> PCT/AU00/00249
<151> 2000-03-24

<150> AU PP 9463
<151> 1999-03-26

<160> 29

<170> PatentIn version 3.3

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ttncncnng cnactgcaat ctgntg

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<222> (16)..(16)
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<223> n = C or T

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<223> n = i

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gtngtnaanc angtnganat gnnnccnac

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<210> 5
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<220>
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<400> 5
atggagagta atgggttacc t

21

<210> 6
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<220>
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<400> 6
gacagtcctc acttaccatc t

21

<210> 7
<211> 33
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<220>
<223> Primer

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33

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<220>
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33

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<220>
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<400> 9

Xaa Leu Gln Glu Leu Met Ala

1 5

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<210> 10
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Construct

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Val Leu His Gln Ile Ala Val Ala Arg Gly Lys
1 5 10

<210> 11
<211> 10
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Construct

<400> 11

Asp Asp Asp Glu Leu Phe Ile Thr Ser Lys
1 5 10

<210> 12
<211> 16
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Construct

<400> 12

Ile Pro Asp Val Val Asn Gln Val Glu Met Ser Pro Thr Leu Gly Gln
1 5 10 15

<210> 13
<211> 7
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<223> Synthetic Construct

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<223> Synthetic Construct

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1 5

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<400> 15

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1 5 10

<210> 16
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<212> PRT
<213> Alfalfa

<400> 16

Lys Gln Gly Tyr Arg His Phe Asp Thr Ala Ala Ala Tyr Gly Ser Glu
1 5 10 15

Gln Ala Leu Gly Glu Ala Leu Lys Glu Ala Ile Glu Leu Gly Leu Val
20 25 30

Thr Arg Glu Glu Leu Phe Val Thr Ser Lys Leu Trp Val Thr Glu Asn
35 40 45

His Pro His Leu Val Ile Pro Ala Leu Gln Lys Ser Leu Lys Thr Leu
50 55 60

Gln Leu Asp Tyr Leu Asp Leu Tyr Leu Ile His Trp Pro Leu Ser Ser
65 70 75 80

Gln Pro Gly Lys Phe Ser Phe Pro Ile Asp Val Ala Asp Leu Leu Pro
85 90 95

Phe Asp Val Lys Gly Val Trp Glu Ser Met Glu Glu Ser Leu Lys Leu
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105 110

Gly Leu Thr Lys Ala Ile Gly Val Ser Asn Phe Ser Val Lys Lys Leu
115 120 125

Glu Asn Leu Leu Ser Val Ala Thr Val Leu Pro Ala Val Asn Gln Val
130 135 140

Glu Met Asn Leu Ala Trp Gln Gln Lys Lys Leu Arg Glu Phe Cys Asn
145 150 155 160

Ala Asn Gly Ile Val Leu Thr Ala Phe Ser Pro Leu Arg Lys Gly Ala
165 170 175

Ser Arg Gly Pro Asn Glu Val Met Glu Asn Asp Met Leu Lys Glu Ile
180 185 190

Ala Asp Ala His Gly Lys Ser Val Ala Gln Ile Ser Leu Arg Trp Leu
195 200 205

Tyr Glu Gln Gly Val Thr Phe Val Pro Lys Ser Tyr Asp Lys Glu Arg
210 215 220

Met Asn Gln Asn Leu Cys
225 230

<210> 17
<211> 230
<212> PRT
<213> Glycyrrhiza

<400> 17

Lys Gln Gly Tyr Arg His Phe Asp Thr Ala Ala Ala Tyr Gly Ser Glu
1 5 10 15

Thr Ala Leu Gly Glu Ala Leu Lys Glu Ala Arg Asp Leu Gly Leu Val
20 25 30

Thr Arg Glu Glu Leu Phe Val Thr Ser Lys Leu Trp Val Thr Glu Asn
35 40 45

His Pro His Leu Val Ile Pro Ala Leu Arg Lys Ser Leu Glu Thr Leu
50 55 60

Gln Leu Glu Tyr Leu Asp Leu Tyr Leu Ile His Trp Pro Leu Ser Ser
65 70 75 80

Gln Pro Gly Lys Phe Ser Phe Pro Ile Gln Val Glu Asp Leu Leu Pro
85 90 95

Phe Asp Val Lys Gly Val Trp Glu Ser Met Glu Glu Cys Leu Lys Leu
100 105 110

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Gly Leu Thr Lys Ala Ile Gly Val Ser Asn Phe Ser Val Lys Lys Leu
115 120 125

Gln Asn Leu Leu Ser Val Ala Thr Ile Arg Pro Ala Val Val Gln Val
130 135 140

Glu Met Asn Leu Ala Trp Gln Gln Lys Lys Leu Arg Glu Phe Cys Thr
145 150 155 160

Ala Asn Gly Ile Val Leu Thr Ala Phe Ser Pro Leu Arg Lys Gly Ala
165 170 175

Ser Arg Gly Pro Asn Glu Val Met Glu Asn Asp Met Leu Lys Gly Ile
180 185 190

Ala Glu Ala His Gly Lys Ser Ile Ala Gln Val Ser Leu Arg Trp Leu
195 200 205

Tyr Glu Gln Gly Val Thr Phe Val Ala Lys Ser Tyr Asp Lys Glu Arg
210 215 220

Met Asn Gln Asn Leu Gln
225 230

<210> 18
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<212> PRT
<213> Soybean

<400> 18

Lys Gln Gly Tyr Arg His Phe Asp Thr Ala Ala Ala Tyr Gly Ser Glu
1 5 10 15

Gln Ala Leu Gly Glu Ala Leu Lys Glu Ala Ile His Leu Gly Leu Val
20 25 30

Arg Ser Gln Asp Leu Phe Val Thr Ser Lys Leu Trp Val Thr Glu Asn
35 40 45

His Pro His Leu Val Leu Pro Ala Leu Arg Lys Ser Leu Lys Thr Leu
50 55 60

Gln Leu Glu Tyr Leu Asp Leu Tyr Leu Ile His Trp Pro Leu Ser Ser
65 70 75 80

Gln Pro Gly Lys Phe Ser Phe Pro Ile Glu Val Glu Asp Leu Leu Pro
85 90 95

Phe Asp Val Lys Gly Val Trp Glu Ser Met Glu Glu Cys Gln Lys Leu
100 105 110

J&J-1825.ST25.txt

Gly Leu Thr Lys Ala Ile Gly Val Ser Asn Phe Ser Val Lys Lys Leu
115 120 125

Gln Asn Leu Leu Ser Val Ala Thr Ile Arg Pro Val Val Asp Gln Val
130 135 140

Glu Met Asn Leu Ala Trp Gln Gln Lys Lys Leu Arg Glu Phe Cys Lys
145 150 155 160

Glu Asn Gly Ile Ile Val Thr Ala Phe Ser Pro Leu Arg Lys Gly Ala
165 170 175

Ser Arg Gly Pro Asn Glu Val Met Glu Asn Asp Val Leu Lys Glu Ile
180 185 190

Ala Glu Ala His Gly Lys Ser Ile Ala Gln Val Ser Leu Arg Trp Leu
195 200 205

Tyr Glu Gln Gly Val Thr Phe Val Pro Lys Ser Tyr Asp Lys Glu Arg
210 215 220

Met Asn Gln Asn Leu His
225 230

<210> 19

<211> 44

<212> PRT

<213> Opium poppy

<400> 19

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1 5 10 15

Val Val Asn Gln Val Glu Met Ser Pro Thr Leu Val Leu His Gln Ile
20 25 30

Ala Val Ala Arg Gly Lys Val Asn Glu Ile Pro Lys
35 40

<210> 20

<211> 1035

<212> DNA

<213> Papaver somniferum

<400> 20

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c t t t a g g t a t g g a a c a g a c t g a a c a a t g g a a c a g a a c a a g a g a g a g a g a a t t g g c g t 120

t t t t g a a a g c g a t a g a g g t c g g t a c a g a c a g a c t t c g a t a c a g t c g t c a 180

a a g a g t g t c t g g t a g g t g a a g c t g a a g c a t t c a a c t t g g t c t a a t t a a a t t c t c g a g 240

a t g a a c t c t t c a t c a c t t c c a a g c t c t g g t g c g c t g a t c t a c g c t g a t c t t g t c c t c c 300

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accatccggt aagcttgaag ccagggaaat ttgttaacga aataccaaag gatcatatcc 420
ttccaatgga ctacaaatct gtatggcag ccatggaaga gtgtcagacc cttggcttca 480
ctagggcaat cgggtctgt aatttctcat gcaaaaggct tcaagagttg atggaaacag 540
ccaacagccc tccagttgtg aatcaagtgg agatgagccc gactttacat caaaaaaaatc 600
tgagggaaata ttgcaaggcc aataatatca tgatcaccgc acactcagtt ttgggagccg 660
taggtgccgc ctggggcacc aatgcagttt tgcattctaa ggtgcttcac cagattgctg 720
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ctgctgttt cttgttatca ccgactggac ctttcaaaac tgaagaagag ttctggatg 960
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tttccctccg ttttg 1035

<210> 21
<211> 966
<212> DNA
<213> *Papaver somniferum*

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tgtcttggtg aagctatagc tgaagcactt caacttggtt taataaaatc tcgagatgaa 240
ctcttcatca ctccaagct ctggtgcgct gatgctcacg ctgatcttgt cctccctgct 300
cttcagaatt ctctgaggaa tctcaaattg gagtacccctg atctatattt gatacaccat 360
ccggtaagct tgaagccagg gaagcttggta aacgaaatac caaaggatca tattcttcca 420
atggactaca aatctgtatg ggcagccatg gaagagtgtc agacccttgg cttcactagg 480
gcaatcggtg tcagtaattt ctcatgcaaa aagcttcaag agttgatggc aacagccaag 540
atccctccag ttgtgaatca agtggagatg agcccgactt tacatcaaaa aaatctgagg 600
gaatattgca aggccaataa tatcatgatc actgcacact cggttttggg agccataggt 660
gctccatggg gcagcaacgc agttatggat tctaagggtgc ttccaggat tgctgtggca 720
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gtggtgaaaaa gtttcaatga agcgaggatg aaggaaaacc ttaagatatt tgattcgaa 840
ctaacggcag aagatatgga aaagatcagt gagattccgc aatctagaac aagctctgct 900
gatttcttgtt tatcaccgac tggaccccttc aaaactgaag aagagttctg ggatgagaag 960
gattga 966

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<210> 22
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<212> DNA
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aaagcgatag aggtcggtta cagacacttc gatacagctg ctgcataccca aagtgaagag 180
tgtcttggtg aagctatagc tgaagcactt caacttggtc taataaaatc tcgagatgaa 240
ctcttcatca cttccaagct ctggtgcgt gatgctcagc ctgatcttgc ctccttgct 300
cttcagaatt ctctgaggaa tcttaaattt gactatcttgc atctatattt gatacaccat 360
ccggtaagct tgaagccagg gaagtttgc aacgaaatac caaaggatca tattttcca 420
atggactaca aatctgtatg ggcagccatg gaagagtgtc agacccttgg cttcactagg 480
gcaatcgggg tctgtatattt ctcatgcaaa aagcttcaag agttgatggc agcagccaaag 540
atccctccag ttgtgaatca agtggagatg agcccgactt tacatcaaaa aaatctgagg 600
gaatattgca aggccaaataa tatcatgatc actgcacact cggttttggg agccatatgt 660
gctccatggg gcagcaatgc agttatggat tctaagggtgc ttcaccagat tgctgtggca 720
agagaaaaat ctgttgcctt ggttagtgc agatgggttt accagcaagg cgccgtctta 780
gtggtaaaaa gtttcaatga agggaggatg aaggaaaacc ttaagatatt tgattggaa 840
ctaacggcag agaatatgga aaagatcagt gagattccgc aatctagaac aagctctgct 900
gatttcttgc tatcaccgac tggaccttgc aaaactgaag aagagttctg ggatgagaag 960
gattga 966

<210> 23
<211> 966
<212> DNA
<213> Papaver somniferum

<400> 23
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ggtatggaa cagctgaaac aatggtaaaa ggaacagaaa gagagaaatt ggcgttttg 120
aaagcgatag aggtcggtta cagacacttc gatacagctg ctgcataccca aagtgaagag 180
tgtcttggtg aagctatagc tgaagcactt caacttggtt taataaaatc tcgagatgaa 240
ctcttcatca cttccaagct ctggtgcgt gatgctcagc ctgatcttgc ctccttgct 300
cttcagaatt ctctgaggaa tctcaaaattt ggttatcttgc atctatattt gatacaccat 360
ccggtaagct tgaagccagg gaaatttgc aacgaaatac caaaggatca tattttcca 420
atggactaca aatctgtatg ggcagccatg gaagagtgtc agacccttgg cttcactagg 480
gcaatcgggg tctgtatattt ctcatgcaaa aagcttcaag agttgatggc agcagccaaag 540
atccctccag ttgtgaatca agtggagatg agccctactt tacatcaaaa aaatctgagg 600
gaatattgca aggccaaataa tatcatgatc actgcacact cggttttggg agccataggt 660

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gctccatggg gcagcaatgc agttatggat tctaaggatgc ttcaccagat tgctgtggca 720
agaggaaaat ctgttgccca ggttagtgc agatgggttt accagcaagg cgcgagtctt 780
gtggtgaaaa gtttcaatga agggaggatg aaggaaaacc ttaagatatt tgattggaa 840
ctaacggcag aagatatgga aaagatcagt gagattccgc aatctagaac aagctctgct 900
gctttcttgtt tattcaccgac tggacctttc aaaactgaag aagagttctg ggatgagaag 960
gattga 966

<210> 24
<211> 154
<212> DNA
<213> Papaver somniferum

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caaggccaat aatatcatga tcactgcaca ctcggtttg ggagccatag gtgctccatg 120
ggcagcaat gcagttatgg attctaaggt gctt 154

<210> 25
<211> 291
<212> DNA
<213> Papaver somniferum

<400> 25
ctctggtgcg ctgatgctca cgctgatctt gtcctccctg ctttcagaa ttctctgagg 60
aatctgaaat tggactacct tgcataat ttgatacacc atccggtaag cttgaagcca 120
ggaaagcttg ttaacgaaat accaaaggat cataattttc caatggacta caaatctgta 180
tggcagcca tggaaagatg tcagaccctt ggcttcacta gggcaatcgg tgtcagtaat 240
ttctcatgca aaaagcttca agagttgatg gcaacagcca agatccctcc a 291

<210> 26
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<212> PRT
<213> Papaver somniferum

<400> 26

Met Glu Ser Asn Gly Val Pro Met Ile Thr Leu Ser Ser Gly Ile Arg
1 5 10 15

Met Pro Ala Leu Gly Met Gly Thr Ala Glu Thr Met Val Lys Gly Thr
20 25 30

Glu Arg Glu Lys Leu Ala Phe Leu Lys Ala Ile Glu Val Gly Tyr Arg
35 40 45

His Phe Asp Thr Ala Ala Ala Tyr Gln Thr Glu Glu Cys Leu Gly Glu
50 55 60

Ala Ile Ala Glu Ala Leu Gln Leu Gly Leu Ile Lys Ser Arg Asp Glu
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65

70

75

80

Leu Phe Ile Thr Ser Lys Leu Trp Cys Ala Asp Ala His Ala Asp Leu
 85 90 95

Val Leu Pro Ala Leu Gln Asn Ser Leu Arg Asn Leu Lys Leu Asp Tyr
 100 105 110

Leu Asp Leu Tyr Leu Ile His His Pro Val Ser Leu Lys Pro Gly Lys
 115 120 125

Phe Val Asn Glu Ile Pro Lys Asp His Ile Leu Pro Met Asp Tyr Lys
 130 135 140

Ser Val Trp Ala Ala Met Glu Glu Cys Gln Thr Leu Gly Phe Thr Arg
 145 150 155 160

Ala Ile Gly Val Cys Asn Phe Ser Cys Lys Arg Leu Gln Glu Leu Met
 165 170 175

Glu Thr Ala Asn Ser Pro Pro Val Val Asn Gln Val Glu Met Ser Pro
 180 185 190

Thr Leu His Gln Lys Asn Leu Arg Glu Tyr Cys Lys Ala Asn Asn Ile
 195 200 205

Met Ile Thr Ala His Ser Val Leu Gly Ala Val Gly Ala Ala Trp Gly
 210 215 220

Thr Asn Ala Val Met His Ser Lys Val Leu His Gln Ile Ala Val Ala
 225 230 235 240

Arg Gly Lys Ser Val Ala Gln Val Ser Met Arg Trp Val Tyr Gln Gln
 245 250 255

Gly Ala Ser Leu Val Val Lys Ser Phe Asn Glu Ala Arg Met Lys Glu
 260 265 270

Asn Leu Lys Ile Phe Asp Trp Glu Leu Thr Ala Glu Asp Met Glu Lys
 275 280 285

Ile Ser Glu Ile Pro Gln Ser Arg Thr Ser Ser Ala Ala Phe Leu Leu
 290 295 300

Ser Pro Thr Gly Pro Phe Lys Thr Glu Glu Glu Phe Trp Asp Glu Lys
 305 310 315 320

Asp

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<211> 321
<212> PRT
<213> Papaver somniferum

<400> 27

Met Glu Ser Asn Gly Val Pro Met Ile Thr Leu Ser Ser Gly Ile Arg
1 5 10 15

Met Pro Ala Leu Gly Met Gly Thr Val Glu Thr Met Glu Lys Gly Thr
20 25 30

Glu Arg Glu Lys Leu Ala Phe Leu Asn Ala Ile Glu Val Gly Tyr Arg
35 40 45

His Phe Asp Thr Ala Ala Ala Tyr Gln Ser Glu Glu Cys Leu Gly Glu
50 55 60

Ala Ile Ala Glu Ala Leu Gln Leu Gly Leu Ile Lys Ser Arg Asp Glu
65 70 75 80

Leu Phe Ile Thr Ser Lys Leu Trp Cys Ala Asp Ala His Ala Asp Leu
85 90 95

Val Leu Pro Ala Leu Gln Asn Ser Leu Arg Asn Leu Lys Leu Glu Tyr
100 105 110

Leu Asp Leu Tyr Leu Ile His His Pro Val Ser Leu Lys Pro Gly Lys
115 120 125

Leu Val Asn Glu Ile Pro Lys Asp His Ile Leu Pro Met Asp Tyr Lys
130 135 140

Ser Val Trp Ala Ala Met Glu Glu Cys Gln Thr Leu Gly Phe Thr Arg
145 150 155 160

Ala Ile Gly Val Ser Asn Phe Ser Cys Lys Lys Leu Gln Glu Leu Met
165 170 175

Ala Thr Ala Lys Ile Pro Pro Val Val Asn Gln Val Glu Met Ser Pro
180 185 190

Thr Leu His Gln Lys Asn Leu Arg Glu Tyr Cys Lys Ala Asn Asn Ile
195 200 205

Met Ile Thr Ala His Ser Val Leu Gly Ala Ile Gly Ala Pro Trp Gly
210 215 220

Ser Asn Ala Val Met Asp Ser Lys Val Leu His Gln Ile Ala Val Ala
225 230 235 240

Arg Gly Lys Ser Val Ala Gln Val Ser Met Arg Trp Val Tyr Gln Gln
245 250 255

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Gly Ala Ser Leu Val Val Lys Ser Phe Asn Glu Ala Arg Met Lys Glu
260 265 270

Asn Leu Lys Ile Phe Asp Ser Glu Leu Thr Ala Glu Asp Met Glu Lys
275 280 285

Ile Ser Glu Ile Pro Gln Ser Arg Thr Ser Ser Ala Asp Phe Leu Leu
290 295 300

Ser Pro Thr Gly Pro Phe Lys Thr Glu Glu Glu Phe Trp Asp Glu Lys
305 310 315 320

Asp

<210> 28
<211> 321
<212> PRT
<213> Papaver somniferum

<400> 28

Met Glu Ser Asn Gly Val Pro Met Ile Thr Leu Ser Ser Gly Ile Arg
1 5 10 15

Met Pro Ala Leu Gly Met Gly Thr Ala Glu Thr Met Val Lys Gly Thr
20 25 30

Glu Arg Glu Lys Leu Ala Phe Leu Lys Ala Ile Glu Val Gly Tyr Arg
35 40 45

His Phe Asp Thr Ala Ala Ala Tyr Gln Ser Glu Glu Cys Leu Gly Glu
50 55 60

Ala Ile Ala Glu Ala Leu Gln Leu Gly Leu Ile Lys Ser Arg Asp Glu
65 70 75 80

Leu Phe Ile Thr Ser Lys Leu Trp Cys Ala Asp Ala His Ala Asp Leu
85 90 95

Val Leu Pro Ala Leu Gln Asn Ser Leu Arg Asn Leu Lys Leu Asp Tyr
100 105 110

Leu Asp Leu Tyr Leu Ile His His Pro Val Ser Leu Lys Pro Gly Lys
115 120 125

Phe Val Asn Glu Ile Pro Lys Asp His Ile Leu Pro Met Asp Tyr Lys
130 135 140

Ser Val Trp Ala Ala Met Glu Glu Cys Gln Thr Leu Gly Phe Thr Arg
145 150 155 160

J&J-1825.ST25.txt

Ala Ile Gly Val Cys Asn Phe Ser Cys Lys Lys Leu Gln Glu Leu Met
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Ala Ala Ala Lys Ile Pro Pro Val Val Asn Gln Val Glu Met Ser Pro
180 185 190

Thr Leu His Gln Lys Asn Leu Arg Glu Tyr Cys Lys Ala Asn Asn Ile
195 200 205

Met Ile Thr Ala His Ser Val Leu Gly Ala Ile Cys Ala Pro Trp Gly
210 215 220

Ser Asn Ala Val Met Asp Ser Lys Val Leu His Gln Ile Ala Val Ala
225 230 235 240

Arg Gly Lys Ser Val Ala Gln Val Ser Met Arg Trp Val Tyr Gln Gln
245 250 255

Gly Ala Ser Leu Val Val Lys Ser Phe Asn Glu Gly Arg Met Lys Glu
260 265 270

Asn Leu Lys Ile Phe Asp Trp Glu Leu Thr Ala Glu Asn Met Glu Lys
275 280 285

Ile Ser Glu Ile Pro Gln Ser Arg Thr Ser Ser Ala Asp Phe Leu Leu
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Ser Pro Thr Gly Pro Phe Lys Thr Glu Glu Glu Phe Trp Asp Glu Lys
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Asp

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<212> PRT
<213> Papaver somniferum

<400> 29

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Met Pro Ala Leu Gly Met Gly Thr Ala Glu Thr Met Val Lys Gly Thr
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Glu Arg Glu Lys Leu Ala Phe Leu Lys Ala Ile Glu Val Gly Tyr Arg
35 40 45

His Phe Asp Thr Ala Ala Ala Tyr Gln Ser Glu Glu Cys Leu Gly Glu
50 55 60

Ala Ile Ala Glu Ala Leu Gln Leu Gly Leu Ile Lys Ser Arg Asp Glu
65 70 75 80

Leu Phe Ile Thr Ser Lys Leu Trp Cys Ala Asp Ala His Ala Asp Leu
85 90 95

Val Leu Pro Ala Leu Gln Asn Ser Leu Arg Asn Leu Lys Leu Glu Tyr
100 105 110

Leu Asp Leu Tyr Leu Ile His His Pro Val Ser Leu Lys Pro Gly Lys
115 120 125

Phe Val Asn Glu Ile Pro Lys Asp His Ile Leu Pro Met Asp Tyr Lys
130 135 140

Ser Val Trp Ala Ala Met Glu Glu Cys Gln Thr Leu Gly Phe Thr Arg
145 150 155 160

Ala Ile Gly Val Ser Asn Phe Ser Cys Lys Lys Leu Gln Glu Leu Met
165 170 175

Ala Ala Ala Lys Ile Pro Pro Val Val Asn Gln Val Glu Met Ser Pro
180 185 190

Thr Leu His Gln Lys Asn Leu Arg Glu Tyr Cys Lys Ala Asn Asn Ile
195 200 205

Met Ile Thr Ala His Ser Val Leu Gly Ala Ile Gly Ala Pro Trp Gly
210 215 220

Ser Asn Ala Val Met Asp Ser Lys Val Leu His Gln Ile Ala Val Ala
225 230 235 240

Arg Gly Lys Ser Val Ala Gln Val Ser Met Arg Trp Val Tyr Gln Gln
245 250 255

Gly Ala Ser Leu Val Val Lys Ser Phe Asn Glu Gly Arg Met Lys Glu
260 265 270

Asn Leu Lys Ile Phe Asp Trp Glu Leu Thr Ala Glu Asp Met Glu Lys
275 280 285

Ile Ser Glu Ile Pro Gln Ser Arg Thr Ser Ser Ala Ala Phe Leu Leu
290 295 300

Ser Pro Thr Gly Pro Phe Lys Thr Glu Glu Glu Phe Trp Asp Glu Lys
305 310 315 320

Asp